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glory. A chapter on 'The Fantasies of Ferns' is unequaled anywhere in fern literature. Not only is the text suited to the person whose mind 'is of the kindergarten order, that needs nice interesting object lessons,' but it will afford real pleasure and some instruction to the professional pteridologist, unless he has lost all sentiment, and love of the beautiful. It will prove a strong corrective for the mania which uproots every pretty, green thing. After reading it none but a confirmed vandal would wantonly disturb a colony of these beautiful plants.

Mrs. Wright's book may easily prepare the amateur for a more particular study of ferns, as suggested in Willard N. Clute's 'Our Ferns in their Haunts' (Frederick A. Stokes Co., New York). This is in fact a popular manual of the ferns of North America north of the Gulf States and east of the Rocky Mountains, and by the aid of an easy non-technical text, good cuts, and many 'half-tone' and colored plates, the subject is made so plain that no one need be without some knowledge of the ferns. It should find a place in the library of every amateur botanist, and it will do no harm to the professional botanist, who may well give it room on his shelves with other helpful books.

Why should not such books as these encourage those organizations which have for their object the cultivation of a love of Nature, and the protection of the native species? The Linnaean Fern Chapter of the Agassiz Association, which has recently issued its Eighth Annual Report (Miss Margaret Slossen, Secretary, Andover, Mass.) is such an organization of mostly amateur students of ferns. What a help such a society may become to the thousands of people who, away from herbaria and museums, desire to keep in touch with the work of others with like tastes. What an inspiration must come from membership in an organization whose members are scattered over the territory from Maine to California, and Canada to Florida and Texas, with one in England and another in far-away New Zealand.

A word may be said here in praise of a new society in Boston and its suburbs, named the 'Society for the Protection of Native Plants.' Its object is 'to check the wholesale destruction to which many of our native plants are ex-

posed.' Every botanist will wish this society the greatest success. Its secretary is Miss Maria E. Carter, Curator of the Herbarium of the Boston Society of Natural History. The urgent need of such a society is apparent not only in the densely populated Eastern States, but fully as much in the western summer resorts, where the hand of the vandal has already exterminated some species.

CHARLES E. BESSEY.

UNIVERSITY OF NEBRASKA.

#### *THE PRESERVATION OF COLORADO CLIFF DWELLINGS.*

THE Colorado Cliff Dwellings Association is endeavoring without aid from the legislature to preserve the ruins which lie on the Mesa Verde, a tableland twenty miles long by eight miles wide, in the southwest corner of Colorado. There are from three hundred to four hundred cliff dwellings including the noted 'Cliff Palace' on this mesa. These are all in the Ute Indian reservation and consequently the state or national government can not control the ruins. A ten years' lease has been made by the Association direct with the Ute Chiefs, by means of which control is had of the Mesa. The Secretary of the Interior having ratified the lease, the Association is now in charge of the ruins, and will open a toll road to them. The money received as toll will, however, be only part of the sum paid to the Indians as rent. The ruins will be kept from weathering and from the depredations of 'relic hunters.'

HARLAN I. SMITH.

#### *PRESENTATION BEFORE THE FACULTY OF CANDIDATES FOR THE DOCTORATE AT THE UNIVERSITY OF PENNSYLVANIA.*

THE University of Pennsylvania inaugurated this year what seems to be in many respects an excellent method of recommending candidates for the degree of Doctor of Philosophy. The usual method, borrowed from the German universities, of examining candidates before the faculty or letting them defend their theses before the faculty is not altogether suited to existing conditions. In Germany it is chiefly a form and appears to be falling into disuse. The

plan is scarcely fair to the candidate if the conferring of the degree depends on the result of a public examination; it is scarcely fair to the faculty if it is a mere formality, and, as a matter of fact, members of the faculty often do not attend. The plan adopted by the University of Pennsylvania is to let the candidate pass a written examination and then bring him before the faculty, where he is presented by the professor under whom he has taken his major subject. The presenter reads a sketch of the candidate's academic life and an outline of the scope and contents of his thesis, after which any member of the faculty may make enquiries of the candidate or the presenter. As an example of the way in which the candidates are presented and as the biographies are themselves of interest, we reproduce the credentials of the first candidate presented in each of the sciences:

*Professor Smith, Presenter.*

Gilbert Hillhouse Boggs was born at Memphis, Tenn., October 2, 1875. He received his early education in the public schools of Athens, Ga., and entered the University of Georgia as a freshman in 1892, graduating with the degree of Bachelor of Science in 1896. He entered the Department of Philosophy of the University of Pennsylvania, February 25, 1897 and remained in residence until February 10, 1898. He reentered October 5, 1898, and has remained in residence for the past three years. His major has been in inorganic chemistry, his minors in organic chemistry and analytic chemistry. He was granted a university scholarship in chemistry for the years 1897-98 and 1898-99, and was appointed to a Harrison Fellowship at Large in the same subject for the years 1899-1901. He was admitted to candidacy for the degree of Doctor of Philosophy when appointed to the Fellowship.

He has completed under the jurisdiction of Group Committee XIV. thirty-three standard lecture courses, exclusive of the laboratory work which has occupied the greater part of his time for four academic years. He has satisfactorily passed written examinations in inorganic, organic and analytical chemistry on May 28-30, 1901, with Professor Smith, Drs. Lorenz and Shinn.

Mr. Boggs has presented a thesis entitled 'I. The Separation of Vanadic Acid from Metals by means of Hydrochloric Acid Gas. II. The Occurrence of Molybdenum in the Mineral Endlichite,' of which the following is an abstract:

Vanadium is being frequently found present in

traces in rocks and minerals. Its separation from allied metals is extremely difficult, and in this research the purpose has been to ascertain how completely hydrochloric acid gas will eliminate the vanadium, it being well established that from the alkali metals the vanadic acid is completely removed by this reagent. This study shows that with the exception of the alkali group of metals the new reagent is inadequate. An additional point of interest is that the metal molybdenum exists in the mineral endlichite, and that its presence there accounts for the fact that the vanadic acid of endlichite is removed by hydrochloric acid gas, probably because it exists as a vanado-molybdate of lead, a form different from that in which it is observed in vanadinite.

Mr. Boggs' thesis is now in the hands of the printer, and the required number of copies will be delivered to the Dean within a few weeks. Mr. Boggs is unanimously recommended by Group Committee XIV. to the Faculty of Philosophy for the degree of Doctor of Philosophy.

*Professor Macfarlane, Presenter.*

Henry Shoemaker Conard was born in Philadelphia, September 12, 1874. He received his early education at the Friends' Select School and Westtown Boarding School. He entered Haverford College as a junior in 1892, and graduated with the degree of Bachelor of Science in 1894. He was a graduate student at Haverford 1894-95, receiving the degree of Master of Arts in 1895. During the four years, 1895 to 1899, he was teacher of science in the Westtown School. He entered the Department of Philosophy, of the University of Pennsylvania, September 26, 1899, as Harrison Fellow in Biology, being thereby made a candidate for the degree of Doctor of Philosophy. He elected his major in botany, his minors in botany and zoology. He has completed in this University, under the jurisdiction of Group Committee XV., twenty standard lecture courses, besides spending practically all his spare time for two years in the laboratory, and has also received credit for his work at Haverford to the extent of four standard courses, making a total of considerably more than twenty-four. He has satisfactorily passed written examinations as follows: On May 28 and 29, 1900, in zoology; on February 7 and 11, 1901, in botany as a minor, and four further examinations in botany as a major, running from May 21 to 22, 1901.

He has presented a thesis entitled 'Water Lilies: a Monograph on the Genus *Nymphaea*.' It will be published in the next volume of the Series in Botany, issued by the University of Pennsylvania. A brief abstract of this thesis is subjoined:

Mr. Conard has described about thirty natural spe-

cies. A like revision has never appeared in English, and not in any language since 1853, during which time many new facts have been brought out. The classification differs slightly from that of previous workers, in view of recently discovered facts of hybridization. An attempt is made to arrange the types as nearly as possible in their evolutionary relationships. Twelve species, representing all the natural groups from all parts of the world, and a number of hybrids and varieties, have been studied carefully in cultivation in the Botanic Garden of the University. Others also have been studied in the collection of the Henry A. Dreer Company, at Riverton, N. J., and elsewhere. Each description takes up :

1. Diagnostic characters.
2. Literature and synonymy.
3. Minute morphological, physiological and, in some critical cases, histological descriptions of flower, leaf, stem and root, and the development from seeds and tubers.
4. Habitat.
5. Remarks, historical and critical.
6. Varieties similarly described.

The results of a number of observations on the times of daily opening and closing of the flowers are incorporated in the descriptions ; these, and the developmental histories of species are, for the most part, entirely new records. The paper is illustrated with photographs and line drawings.

Mr. Conard is unanimously recommended to the Faculty of Philosophy by Group Committee XV. for the degree of Doctor of Philosophy.

*Professor Crawley, Presenter.*

Burton Scott Easton was born in Hartford, Conn., December 4, 1877. He received his early education at the Hamilton School, Philadelphia, and with private tutors in Germany. He entered the University of Pennsylvania as a freshman in 1894, receiving the degree of Bachelor of Science in 1898. During the year 1898-99 he was instructor in mathematics and astronomy in the State University of Iowa, and pursued graduate work in the same institution. He entered the Department of Philosophy of the University of Pennsylvania, September 27, 1899, electing his major in mathematics, one minor in mathematics, and the other minor in astronomy. He was appointed Harrison Fellow at Large in Mathematics for the year 1900-01, and was transferred to the regular fellowship in mathematics and astronomy January 11, 1901. He has received credit for the following work : (1) For graduate work in mathematics pursued before receiving his Bachelor's degree, and not credited toward that degree, four standard courses ; (2) for graduate work in mathematics at the State University

of Iowa, six courses ; (3) for graduate work in this University since 1899, sixteen courses, a total of twenty-six standard courses. He has satisfactorily passed written examinations on March 30, April 4 and May 16, 1901, in mathematics with Professor Crawley, Assistant Professors Fisher and Schwatt and Dr. Hallett ; on March 16, 1901, in astronomy with professor Doolittle and Mr. Eric Doolittle. He has presented a thesis entitled 'Substitutions and Substitution Groups.' He has deposited with the Dean a copy of this thesis and the money necessary to print it. The thesis will appear in the spring of 1902. A brief outline of its contents is as follows :

The group theory is one of the most recent developments of mathematics. It is far-reaching in its applications and is a most prolific field of research at the present day. The literature of the subject is, however, principally to be found scattered through the pages of the mathematical and scientific journals, and is therefore disjointed and fragmentary not only in form but also in the manner of its presentation. Moreover, much of importance is almost useless from the difficulty of finding it when wanted.

The primary object of the dissertation is to present the results of the most recent investigations in this subject in such a manner as to give a coherent view of what has been done. The way in which this has been accomplished by the candidate shows good mathematical judgment, and a thorough appreciation of the philosophy of recent mathematics. Only a portion of what has actually been accomplished in carrying out this work is embodied in the dissertation, which is devoted in the main to a careful consideration of transitive and intransitive groups, primitive and imprimitive groups, and the isomorphism of one group with another. The limits of *transitivity* have received special attention. A certain looseness has been found to exist in the use of some terms, notably in the expression 'permutable groups.' Mr. Easton has given precise definitions in all these cases, and the necessary modifications in the subsequent developments have been introduced.

Mr. Easton is unanimously recommended to the Faculty of Philosophy by Group Committee XI. for the degree of Doctor of Philosophy.

*Professor Doolittle, Presenter.*

Henry Brown Evans was born in Dayton, Ohio, July 2, 1871. He was educated in the public schools of his native town, graduating from the High School in 1889. He entered the Freshman Class of Lehigh University the same year, and received the degree of Mechanical Engineer in 1893. He was instructor in mathematics and astronomy at Lehigh, 1894-95, and has been instructor in astronomy in this University

since 1895. He entered the Department of Philosophy October 23, 1895, electing his major in astronomy, his minors in mathematics and philosophy. He was admitted to candidacy for the degree of Doctor of Philosophy October 1, 1897. He has completed twenty-seven standard courses. He has satisfactorily passed written examinations in astronomy with Professor Doolittle on May 4 and 11, 1901; in mathematics with Assistant Professors Fisher and Schwatt on March 7, 1901; in philosophy with Dr. Singer on March 25, 1901. He has presented a thesis entitled 'The Right Ascensions of One Hundred and Eighty Latitude Stars,' and has deposited with the Dean a copy of the manuscript and the money necessary to print it. The scope of this thesis may be described as follows:

The determination of the latitude of any single point of the earth's surface, by the zenith telescope method, depends ultimately on the positions of the stars observed for that purpose. The object of this thesis is the determination from all available data of definitive values of the right ascensions of one hundred and eighty stars. This material is needed for the determination of the variations of latitude at the Sayre Observatory of Lehigh University and at the Flower Observatory of the University of Pennsylvania. A definitive investigation of the right ascensions has not been undertaken before this. The necessary data were found in the star catalogues heretofore published, from 1755 to date. Altogether positions of these stars were taken from about one hundred such sources. The observed positions were then combined by the method of least squares, and the definitive values of the right ascensions of the one hundred and eighty stars in question for 1875.0 were thus determined.

Mr. Evans is unanimously recommended to the Faculty of Philosophy by Group Committee XII. for the degree of Doctor of Philosophy.

*Professor Patten, Presentor.*

John Paul Goode was born at High Forest, Minn., November 21, 1862. He received his early education in the public schools of Olmstead County, Minn., and in the Rochester Seminary, Rochester, Minn. He entered the University of Minnesota as a freshman in 1885, and received the degree of Bachelor of Science in 1889. From 1889 to 1898 he was professor of the natural sciences in the State Normal School, Moorhead, Minn. He spent the summer of 1894 in the Summer School of Harvard University, that of 1895 as a graduate student in geology at the University of Chicago, that of 1896 as instructor in geology in the Summer School of the University of Minnesota. During the autumn and winter quarters of the year

1897-98 he was fellow in geology at the University of Chicago, being absent on leave from his professorship. During the four summers, 1897, '98, '99 and 1900, he was instructor in physiography and meteorology at the University of Chicago. In the year 1898-99 he spent the autumn, winter and spring quarters as a graduate student of geology and economics at the University of Chicago. In 1899 he was appointed to the professorship of the physical sciences and geography in the Eastern Illinois State Normal School, Charleston, Ill., which position he still holds, having been absent on leave during the past academic year.

He entered the Department of Philosophy of the University of Pennsylvania October 1, 1900, and remained in residence until April 5, 1901. On March 8, 1901, the Executive Committee decided to consider this period of residence as satisfying the rule requiring one year of residence. Mr. Goode elected his major in economics, his minors in geology and sociology. He completed in the University of Chicago fifteen standard courses in geology, two in mineralogy, and eight in economics. In this University he has completed in economics nine standard courses, making a total of thirty-four. He has satisfactorily passed written examinations on November 16, 1900, in physiography with Assistant Professor Brown; on March 30 and April 4, 1901, in economics with Professor Patten and Assistant Professor Seager; on March 23, 1901, in economic geology with Assistant Professor Brown, and on April 1 and 3, 1901, in sociology with Assistant Professor Lindsay. He has presented a thesis entitled 'The Influence of Physiographic Factors upon the Occupations and the Economic Development of the United States.' He has deposited with the Dean a letter from Mr. E. M. Lehnerts, guaranteeing the publication of the thesis in the *Bulletin of the American Bureau of Geography*. The scope of the thesis may be briefly described as follows:

1. A study of the geographic location of the United States, showing its relation to other lands and the effects that this position has on its climate.
2. A sketch of the geographical development of North America, and its effects on the distribution of mineral wealth, drainage and the formation of soils.
3. A detailed study of the physiographic provinces of the United States, showing how the relief of the land facilitates or obstructs settlement and trade. With this is given a classification of harbors and many illustrations of how they are formed and improved or destroyed.
4. A study of climate, of ocean currents and of the distribution of the rainfall.
5. The influence of forests on man; his debt to

wood as a material in the constructive arts. Future possibilities of forests when coal is gone.

6. A study of the common cereals and the conditions of soils and climate demanded by each species.

Mr. Goode is unanimously recommended to the Faculty of Philosophy by Group Committee X. for the degree of Doctor of Philosophy.

*Professor Conklin, Presentor.*

John Raymond Murlin was born in Auglaize County, Ohio, April 30, 1874. He received his early education in the public schools of Mercer County, Ohio, at the Ohio Normal University, and in the Preparatory Department of Ohio Wesleyan University. He entered the Ohio Wesleyan University as a freshman in March, 1894, and received the degree of Bachelor of Science in June, 1897. During his senior year he was instructor in physiology and histology, and the following year was instructor in physiology and zoology in the same institution. He entered the Department of Philosophy of this University, September 24, 1898, electing his major and one minor in zoology, and one minor in botany. In 1899 he was granted a Harrison Fellowship at Large in zoology, this appointment carrying with it candidacy for the degree of Doctor of Philosophy. He was reappointed to the same Fellowship for the current year.

He has completed in this University twenty and one-fourth standard courses, and has in addition devoted practically his entire time for three years to laboratory work, the summers of these years being spent in the Marine Biological Laboratory at Wood's Holl, Mass. The laboratory work which Mr. Murlin has done would probably be equivalent to sixty standard courses. He has satisfactorily passed written examinations in zoology on May 28 and June 2, 1900, with Professor Conklin and Dr. Moore; on May 28 and 29, 1901, with Professor Conklin and Assistant Professor Montgomery, and in botany on May 30, 1900, with Professor Macfarlane.

Mr. Murlin has presented a thesis entitled, 'The Digestive System of the Land Isopods, with special reference to the Morphology of Absorption and Secretion,' and has deposited with the Dean a copy of it, together with the money necessary to print it. Its scope may be outlined as follows:

Structural and functional changes in the intestine of two common genera of land Isopods have been followed during (1) growth; (2) the process of shedding the chitinous lining; and (3) the stages of food absorption. The intestine might be described as a cylindrical conduit, the wall made up of a single layer of cubical elements of the same size, and lined with a homogeneous but porous intima. These elements, the cells, are very large, being visible in adult

specimens even to the naked eye. The minute structure of both cell-body and nucleus is seen with high powers of the microscope to be alveolar, *i. e.*, the protoplasm is composed of very small semi-fluid vesicles, between which is a homogeneous interalveolar substance and supporting fibers, running from the inner to the outer side of the cells. During growth of the animal the intestine increases in size both by multiplication (direct cell-division) and by enlargement of the cells. When the lining (chitin) is shed, the fibers on the side of the cells next the lumen disappear, and in their place is seen a fluid substance, by the hardening of which the new lining is laid down.

In the digestion of proteids, as is well known, several stages intervene between the insoluble condition in which the food enters the stomach, and the readily soluble condition which it must reach before it can be assimilated. Hitherto the food has been traced to the absorbing cells, and has been identified in different form in the blood of many animals after having traversed the cells. The purpose of this study was to follow the food *through* the cells. Albumose, the first soluble stage in the digestion of albuminous foods, is recognized in the cells eight hours after feeding. The food in this form traverses the interalveolar spaces, and may accumulate in the outer side of the cell from sixteen hours after feeding, onward. The course of the food through the wall of the intestine is not visibly influenced by the cell-structure except in a purely mechanical manner. Albumose is not found in the blood of the animal, which bathes the outer side of the intestinal wall; the inverse change back to albumen must therefore be effected before the food reaches the circulation. A finely granular substance comes from the nucleus and is associated with albumose in its passage through the cell; it probably acts on the albumose either to carry the digestive process farther, or to begin the inverse process (synthesis toward albumen), or both.

Carbohydrates are readily digested in the intestine, dextrose, the soluble form of starch, being found twenty-four hours after feeding. In the absorption of fats the indications are that splitting-up by ferment action into fatty acid and glycerine takes place in the lumen of the intestine, and synthesis by ferment action takes place within the cell.

The digestive secretion is first recognized in immature cells of the 'liver' in the form of (zymogen) granules. During the growth of these cells the granules increase in size, become looser in structure, more soluble in certain reagents, and more stainable. The secretion is set free into the lumen of the gland in the form of a proteid fluid by mere evacuation of the cells, or by fragmentation and dissolution of their luminal ends. Discharging cells are found from

twelve to ninety hours after feeding with proteids. The secretion is poured into the intestine, where it acts by means of its ferments on the three classes of foods : proteids, carbohydrates and fats.

Mr. Murlin is unanimously recommended by Group Committee XV. as a candidate for the degree of Doctor of Philosophy.

*Professor Crawley, Presentor.*

Roxana Hayward Vivian was born at Hyde Park, Mass., December 9, 1871. She received her early education in the public schools of Hyde Park, graduating from the High School in 1890. She entered the freshman class of Wellesley College the same year, receiving the degree of Bachelor of Arts in 1894. From 1895 to 1898 she taught Greek and mathematics in a preparatory school, and from 1896 to 1898 pursued graduate work in the same subjects at Wellesley college. She entered the Department of Philosophy of this University October 10, 1898, as *alumnæ* fellow in mathematics. This appointment carried with it candidacy for the degree of Doctor of Philosophy. She was twice reappointed to her fellowship, holding it for three successive years. She elected her major and one minor in mathematics, and the other minor in astronomy. She has completed thirty standard courses, and has satisfactorily passed written examinations in astronomy with Professor Doolittle and Mr. Eric Doolittle, February 14, 1901 ; in mathematics with Professor Crawley, Assistant Professors Fisher and Schwatt and Dr. Hallett, on April 4 and 13, and May 11, 1901. She has presented a thesis entitled 'The Poles of a Right Line with Respect to a Curve of Order  $n$ .' The thesis will be printed at once. Pending its appearance Miss Vivian has deposited with the Dean a copy of the manuscript and the money necessary to print it. The scope of the thesis may briefly be outlined as follows :

The general subject of poles and polars with respect to Higher Plane Curves has been studied by numerous mathematicians, notably by Steiner, Cremona and Clebsch. Steiner gave in *Crelle's Journal*, Vol. XLVII., a large number of theorems relating to this subject, but he omitted the proofs. They were all proved subsequently by Cremona. Cremona's method was peculiar to himself, that is, he adapted a somewhat more general theory, that of the loci of harmonic means, to the theory of poles and polars. In discussing these problems Miss Vivian uses the analytic method. The particular line of discussion which she has taken up is one which has not been treated in any detail by any former writer. She has handled the subject ably, and has arrived at some very interesting results. In one or two instances her results show that the statements of former writers must be

taken with certain limitations, which do not appear to have been considered. Her principal object is to establish the ways in which the poles of a line are limited when the line has certain prescribed relations to the fundamental curve of the  $n$ th order, and to its allied curves, the Hessian and Steinerian. Under particular conditions certain points in the plane will be poles for all lines in the plane, while the other poles, called by the candidate 'free poles,' vary with the line. Many writers do not class the first as poles at all, but it seems more reasonable to class them with the other poles, since they have all the required properties of such points ; and, besides, it is more in keeping with the present tendency of thought on these subjects to do so. The subdivisions of the paper are as follows :

1. The pencil of curves of which the poles are base points.
2. The related curves.
3. Poles when the curve  $u-o$  has no singularities.
4. The inflection locus.
5. Poles when the curve  $u-o$  has double points and cusps.
6. Intersections of higher order with the Steinerian.
7.  $u-o$  with triple points and higher multiple points.

Miss Vivian is unanimously recommended to the Faculty of Philosophy by Group Committee XI. for the degree of Doctor of Philosophy.

SCIENTIFIC NOTES AND NEWS.

WE publish in this issue of SCIENCE the admirable presidential address given before the American Association, at Denver, on Tuesday, by Professor Woodward, and the vice-presidential address given by Professor Davenport before the Zoological Section, which is also a model of what such an address should be. We hope to publish next week an account of the meeting and one or two further addresses by the vice-presidents.

PROFESSOR THEODORE WM. RICHARDS, of Harvard University, has been invited to fill the newly established professorship of inorganic chemistry in the University at Göttingen. The position is entirely free from routine teaching, being confined to research work with the assistance of such advanced students as may be selected. It will be remembered that Professor J. H. van't Hoff was called from Holland to fill a similar position at the University of Berlin. The fact that Germany should invite two for-